

Radiologic Technologists

(O*NET 32919 and 32921)

Significant Points

- Radiologic technologists with cross training in nuclear medicine technology or other modalities will have the best prospects.
- Sonographers should experience somewhat better job opportunities than other radiologic technologists, as ultrasound becomes an increasingly attractive alternative to radiologic procedures.

Nature of the Work

Perhaps the most familiar use of the x ray is the diagnosis of broken bones. However, medical uses of radiation go far beyond that. Radiation is used not only to produce images of the interior of the body, but to treat cancer as well. At the same time, the use of imaging techniques that do not involve x rays, such as ultrasound and magnetic resonance imaging (MRI), is growing rapidly. The term “diagnostic imaging” embraces these procedures as well as the familiar x ray.

Radiographers produce x-ray films (radiographs) of parts of the human body for use in diagnosing medical problems. They prepare patients for radiologic examinations by explaining the procedure, removing articles such as jewelry, through which x rays cannot pass, and positioning patients so that the parts of the body can be appropriately radiographed. To prevent unnecessary radiation exposure, technologists surround the exposed area with radiation protection devices, such as lead shields, or limit the size of the x-ray beam. Radiographers position radiographic equipment at the correct angle and height over the appropriate area of a patient's body. Using instruments similar to a measuring tape, technologists may measure the thickness of the section to be radiographed and set controls on the machine to produce radiographs of the appropriate density, detail, and contrast. They place the x-ray film under the part of the patient's body to be examined and make the exposure. They then remove the film and develop it.

Experienced radiographers may perform more complex imaging tests. For fluoroscopies, radiographers prepare a solution of contrast medium for the patient to drink, allowing the radiologist, a physician who interprets radiographs, to see soft tissues in the body. Some radiographers, called *CT technologists*, operate computerized tomography scanners to produce cross sectional views of patients. Others operate machines using giant magnets and radio waves rather than radiation to create an image and are called *magnetic resonance imaging (MRI) technologists*.

Sonographers, also known as ultrasonographers, direct nonionizing, high frequency sound waves into areas of the patient's body; the equipment then collects reflected echoes to form an image. The image is viewed on a screen and may be recorded on videotape or photographed for interpretation and diagnosis by physicians. Sonographers explain the procedure, record additional medical history, select appropriate equipment settings and use various patient positions as necessary. Viewing the screen as the scan takes place, sonographers look for subtle differences between healthy and pathological areas, decide which images to include, and judge if the images are satisfactory for diagnostic purposes. Sonographers may specialize in neurosonography (the brain), vascular (blood flows), echocardiography (the heart), abdominal (the liver, kidneys, spleen, and pancreas), obstetrics/gynecology (the female reproductive system), and ophthalmology (the eye).

Radiologic technologists must follow physicians' orders precisely and conform to regulations concerning use of radiation to protect themselves, their patients, and coworkers from unnecessary exposure.



A diagnostic medical sonographer performs an abdominal ultrasound.

In addition to preparing patients and operating equipment, radiologic technologists keep patient records and adjust and maintain equipment. They may also prepare work schedules, evaluate equipment purchases, or manage a radiology department.

Working Conditions

Most full-time radiologic technologists work about 40 hours a week; they may have evening, weekend, or on-call hours.

Technologists are on their feet for long periods and may lift or turn disabled patients. They work at diagnostic machines but may also do some procedures at patients' bedsides. Some radiologic technologists travel to patients in large vans equipped with sophisticated diagnostic equipment.

Although potential radiation hazards exist in this occupation, they are minimized by the use of lead aprons, gloves, and other shielding devices, as well as by instruments monitoring radiation exposure. Technologists wear badges measuring radiation levels in the radiation area, and detailed records are kept on their cumulative lifetime dose.

Employment

Radiologic technologists held about 162,000 jobs in 1998. Most technologists were radiographers, while the rest worked as sonographers. About 1 radiologic technologist in 5 worked part time. More than half of jobs for technologists are in hospitals. Most of the rest are in physicians' offices and clinics, including diagnostic imaging centers.

Training, Other Qualifications, and Advancement

Preparation for this profession is offered in hospitals, colleges and universities, vocational-technical institutes, and the Armed Forces. Hospitals, which employ most radiologic technologists, prefer to hire those with formal training.

Formal training is offered in radiography and diagnostic medical sonography (ultrasound). Programs range in length from 1 to 4 years and lead to a certificate, associate's degree, or bachelor's degree. Two-year associate's degree programs are most prevalent.

Some 1-year certificate programs are available for experienced radiographers or individuals from other health occupations, such as medical technologists and registered nurses, who want to change fields or specialize in sonography. A bachelor's or master's degree in one of the radiologic technologies is desirable for supervisory, administrative, or teaching positions.

The Joint Review Committee on Education in Radiologic Technology accredits most formal training programs for this field. They

accredited 602 radiography programs in 1999. The Joint Review Committee on Education in Diagnostic Medical Sonography accredited 77 programs in sonography in 1998.

Radiography programs require, at a minimum, a high school diploma or the equivalent. High school courses in mathematics, physics, chemistry, and biology are helpful. The programs provide both classroom and clinical instruction in anatomy and physiology, patient care procedures, radiation physics, radiation protection, principles of imaging, medical terminology, positioning of patients, medical ethics, radiobiology, and pathology.

For training programs in diagnostic medical sonography, applicants with a background in science, or experience in one of the health professions, generally are preferred. Some programs consider applicants with liberal arts backgrounds, however, as well as high school graduates with courses in math and science.

In 1981, Congress passed the Consumer-Patient Radiation Health and Safety Act, which aims to protect the public from the hazards of unnecessary exposure to medical and dental radiation by ensuring operators of radiologic equipment are properly trained. Under the act, the Federal Government sets voluntary standards that the States, in turn, may use for accrediting training programs and certifying individuals who engage in medical or dental radiography. Because ultrasound does not use ionizing radiation, sonographers are excluded from this act.

In 1999, 35 States and Puerto Rico licensed radiologic technologists. No State requires sonographers to be licensed. Voluntary registration is offered by the American Registry of Radiologic Technologists (ARRT) in radiography. The American Registry of Diagnostic Medical Sonographers (ARDMS) certifies the competence of sonographers. To be eligible for registration, technologists generally must graduate from an accredited program and pass an examination. Many employers prefer to hire registered radiographers and sonographers.

With experience and additional training, staff technologists may become specialists, performing CT scanning, angiography, and magnetic resonance imaging. Experienced technologists may also be promoted to supervisor, chief radiologic technologist, and—ultimately—department administrator or director. Depending on the institution, courses or a master's degree in business or health administration may be necessary for the director's position. Some technologists progress by becoming instructors or directors in radiologic technology programs; others take jobs as sales representatives or instructors with equipment manufacturers.

Radiographers must complete 24 hours of continuing education every other year and provide documentation to prove they have complied with these requirements. Sonographers must complete 30 hours of continuing education every 3 years.

Job Outlook

Employment of radiologic technologists is expected to grow as fast as the average for all occupations through 2008, as the population grows and ages, increasing the demand for diagnostic imaging and therapeutic technology. Although physicians are enthusiastic about the clinical benefits of new technologies, the extent to which they are adopted depends largely on cost and reimbursement considerations. Some promising new technologies may not come into widespread use because they are too expensive and third-party payers may not be willing to pay for their use.

Sonographers should experience somewhat better job opportunities than radiographers. Ultrasound is becoming an increasingly attractive alternative to radiologic procedures. Ultrasound technology is expected to continue to evolve rapidly and spawn many new ultrasound procedures. Furthermore, because ultrasound does not use radiation for imaging, there are few possible side effects.

Radiologic technologists who are educated and credentialed in more than one type of imaging technology, such as radiography and ultrasonography or nuclear medicine, will have better employment

opportunities as employers look for new ways to control costs. In hospitals, multi-skilled employees will be the most sought after, as hospitals respond to cost pressures by continuing to merge departments.

Hospitals will remain the principal employer of radiologic technologists. However, employment is expected to grow most rapidly in offices and clinics of physicians, including diagnostic imaging centers. Health facilities such as these are expected to grow very rapidly through 2008 due to the strong shift toward outpatient care, encouraged by third-party payers and made possible by technological advances that permit more procedures to be performed outside the hospital. Some job openings will also arise from the need to replace technologists who leave the occupation.

Earnings

Median annual earnings of radiologic technologists and technicians were \$32,880 in 1998. The middle 50 percent earned between \$27,560 and \$39,420 a year. The lowest 10 percent earned less than \$23,650 and the highest 10 percent earned more than \$47,610 a year. Median annual earnings in the industries employing the largest number of radiologic technologists and technicians in 1997 were:

Medical and dental laboratories	\$34,400
Hospitals	31,600
Offices and clinics of medical doctors	30,800

Related Occupations

Radiologic technologists operate sophisticated equipment to help physicians, dentists, and other health practitioners diagnose and treat patients. Workers in related occupations include radiation dosimetrists, nuclear medicine technologists, cardiovascular technologists and technicians, radiation therapists, perfusionists, respiratory therapists, clinical laboratory technologists, and electrophysiology technologists.

Sources of Additional Information

For career information, enclose a stamped, self-addressed business size envelope with your request to:

- ☛ American Society of Radiologic Technologists, 15000 Central Ave. SE., Albuquerque, NM 87123-3917.
- ☛ Society of Diagnostic Medical Sonographers, 12770 Coit Rd., Suite 708, Dallas, TX 75251.
- ☛ American Healthcare Radiology Administrators, 111 Boston Post Rd., Suite 105, P.O. Box 334, Sudbury, MA 01776.

For the current list of accredited education programs in radiography, write to:

- ☛ Joint Review Committee on Education in Radiologic Technology, 20 N. Wacker Dr., Suite 600, Chicago, IL 60606-2901.

For a current list of accredited education programs in diagnostic medical sonography, write to:

- ☛ The Joint Review Committee on Education in Diagnostic Medical Sonography, 7108 S. Alton Way, Building C., Englewood, CO 80112. Internet: <http://www.caahep.org/programs/dms-prog.htm>

Surgical Technologists

(O*NET 32928)

Significant Points

- Most educational programs for surgical technologists last approximately 1 year and result in a certificate.
- Increased demand for surgical technologists is expected as the number of surgical procedures grows.